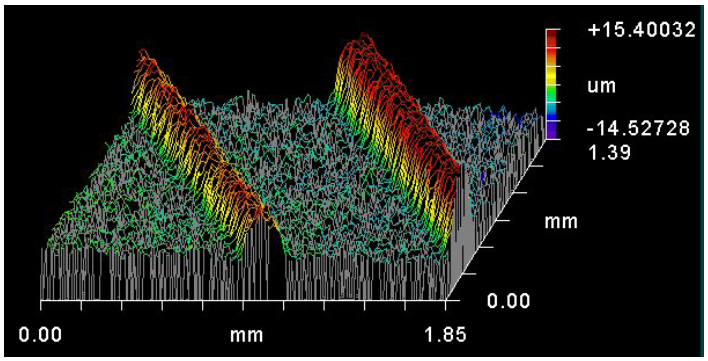
Transforming Thermal Spray Technology through Science:

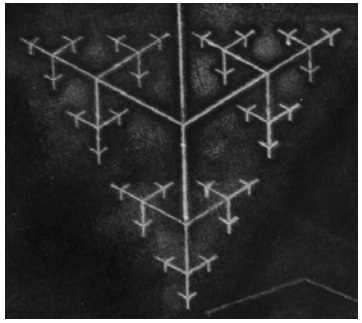
From Protective Coatings to Direct Write Multilayer Electronics and Sensors

The Center for Thermal Spray Research is poised to tranform electronics and sensor technology by introducing a radically new approach to fabricating thick film materials through a maskless low temperature direct write process. Funded through DARPA's Mesoscopic Integrated Conformal Electronics (MICE) program and benefitting from MRSEC enhanced science base and facilities, the Center is creating novel opportunities in materials synthesis and applications. Some examples of devices are presented below.

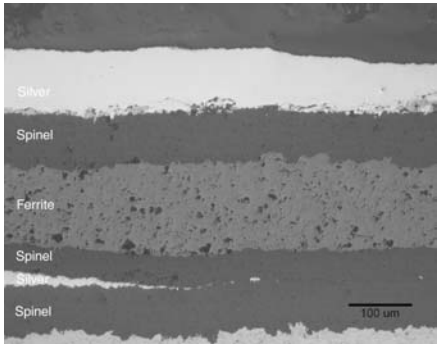
High-frequency inductor



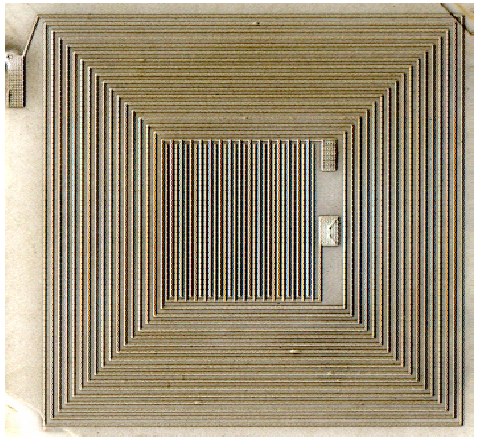
Direct write lines



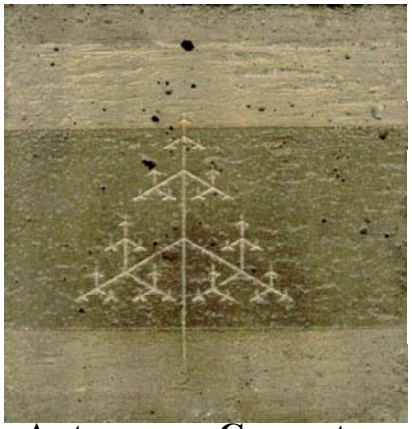
Direct write antenna on cloth



Inductor Cross-section



LC Resonance Circuit



Antenna on Concrete With Polymer overcoat

DARPA MICE mesoscopic integrated conformal electronics

STONY BROOK STATE UNIVERSITY OF NEW YORK

WISE Day: Arc Sprayed Copper for Decorative Surfacing

Lysa Russo, State University of New York at Stony Brook,

DMR-0080021

Education:

Dr. James Quinn, Director of Laboratories in the Materials Science Department, serves as coordinator of the Women in Science and Engineering (WISE) program. CTSR staff work closely with the students during their research rotations, allowing them first-hand experience with various thermal spray technologies. The lab participates in these research rotations throughout the year.

Pictured at right are high school WISE members showing off their copper sprayed sign and the twin wire electric arc torch which was used to create it.

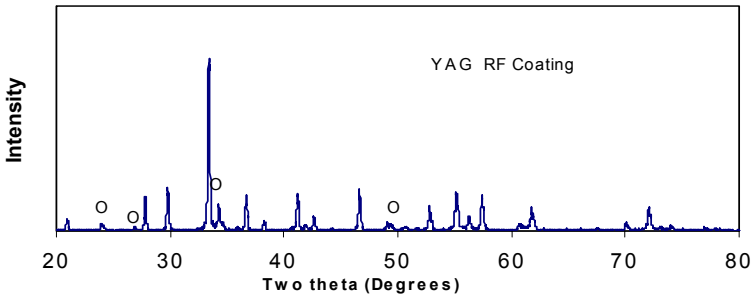
Outreach:

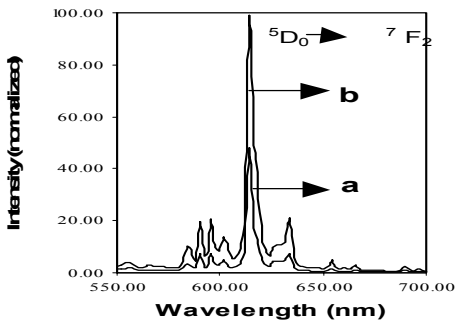
10^{th} and 11^{th} grade high school members of WISE spend the day at the CTSR learning about the various thermal spray processes. The girls have the opportunity of working in a spray booth, creating decorative signs and coatings, highlighting their lab experience!

Rapid Single Step Development of Functional oxide Coatings by a Novel Precursor Plasma Spraying Technique

Sanjay Sampath, SUNY-Stony Brook DMR-0080021

A novel and fast method has developed by an interdisciplinary research group at Stony Brook University MRSEC to make functional oxide ceramic coating including phosphor films by a precursor plasma spraying technique. This process enables high speed discrete combinatorial synthesis as well as high throughput materials fabrication method for functional ceramic oxides such as yttrium aluminum garnet YAG for display applications. Europium-doped YAG luminescent films have been produced directly from a solution precursor using a radio frequency (RF) plasma spray technique. Crystalline and luminescent films were grown on Si (100) and steel substrates by this process in *under 3 minutes* and can be applied over very large areas. The enhanced photo luminescence (PL) intensity observed from these films is related due to the highly crystalline nature of the coating combined with spherical morphology of the grains and the sub-micron grain size.





Red emission from Eu-Y_2O_3 Film when excited with a Mineralight UV lamp.

Industrial Outreach and Knowledge Transfer

Lysa Russo, State University of New York at Stony Brook,

DMR-0080021

Consortium on Thermal Spray Technology: Linking Research to Practice

Already in its second year of collaborative research, the Consortium on Thermal Spray Technology is made up of ten of the industries leading global applicators of coatings, producers of equipment and materials and end-users of the technology.

The Consortium serves as a very effective vehicle for the transfer of the scientific base of knowledge being established by the CTSR out to those in industry. This has allowed for an immediate impact on TS technology creating exciting new perspectives and technological thrusts.